

Appln No. 09/744,515

Amdt date May 11, 2004

Reply to Office action of November 13, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A gearbox adaptor ~~including~~ comprising:
a hub defining a longitudinal axis adapted to be engageable with a gear shaft for rotation therewith;
at least one piston mounted within said hub;
means for supplying fluid through ~~the~~ at least one passage on an exterior of the hub to an interior passage in the hub adjacent the at least one piston in a radially inwardly flow direction towards the longitudinal axis of the hub to pressurize a first face of said at least one piston(s), so as to move ~~a first piston of~~ said at least one piston in a first direction;
at least one gear locatable on said gear shaft adjacent said hub;
at least one clutch means ~~including a first clutch means~~ positioned between said ~~first at least one~~ piston and a side wall of ~~a first gear of~~ said at least one gear, part of said ~~first at least one~~ clutch means being engaged with said hub and a different part of said ~~first~~ clutch means being engageable with said ~~first at least one~~ gear;
wherein said at least one gear is freely rotatable relative to said shaft, and said at least one clutch means being located and arranged such that movement of said ~~first at least one~~ piston in said first direction inter-engages said parts of said ~~first at least one~~ clutch means to drivingly engage said ~~first at least one~~ gear with said gear shaft.
2. (Currently amended) The gearbox adaptor as claimed in claim 1 wherein said hub, said at least one piston(s), and said at least one clutch means ~~all are~~ all concentric and said hub is adapted to be concentrically engageable with said gear shaft.

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3. (Currently amended) The gearbox adaptor as claimed in claim 2 wherein said at least one piston(s) and said at least one clutch means both are both annular.

4. (Currently amended) The gearbox adaptor as claimed in claim 2 wherein said at least one clutch means comprises a clutch pack which ~~consists of~~comprises a first series of spaced plates, each of which is engaged with the hub for rotation therewith but which is reciprocable parallel to the longitudinal axis of said hub; and

and a second series of spaced plates, each of which is engageable with one of said at least one gear mounted upon said gear shaft but which is reciprocable parallel to the longitudinal axis of said hub;

said second series of plates being interleaved with the plates of said first series.

5. (Currently amended) The gearbox adaptor as claimed in claim 2 wherein said at least one clutch means and said at least one piston(s) are mounted in a recess in said hub.

6. (Currently amended) The gearbox adaptor as claimed in claim 5 further comprising a casing surrounding at least part of the exterior of said hub, ~~said casing being mounted upon said hub but not rotatable therewith;~~

at least one first fluid passage being formed between the an interior of the casing and the exterior of the hub, said first fluid passage being in communication with said means for supplying fluid to a the first face of said at least one piston(s); and

which comprises at least one a second fluid passage formed through in said hub.

7. (Currently amended) The gearbox adaptor as claimed in claim 1 ~~incorporating two said further comprising a second pistons and two said a second clutch means, the first at least one piston and the corresponding first at least one clutch means being mounted in a first recess~~

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formed in one end of the hub, and the second piston and the ~~corresponding~~ second clutch means being mounted in a second recess formed in ~~the other~~ a second end of the hub;

wherein part of the first ~~at least one~~ clutch means is engageable with a ~~first~~ the at least one gear and part of the second clutch means is engageable with a second gear.

8. (Currently amended) The gearbox adaptor as claimed in claim 7 further comprising a casing surrounding at least part of the exterior of said hub, ~~said casing being mounted upon said hub but not rotatable therewith; and~~

~~two separate first a second~~ fluid passages being formed between the interior of the casing and the exterior of the hub, the first fluid passage and the second ~~each said first~~ fluid passage being ~~in-~~ adapted for fluid communication with the ~~corresponding said means for supplying fluid to a first face of said corresponding piston, which comprises a second fluid passage formed through said hub.~~

9. (Currently amended) The gearbox adaptor as claimed in claim 1 wherein said fluid is hydraulic fluid.

10. (Currently amended) The gearbox adaptor as claimed in claim 1 wherein said fluid is pneumatic fluid.

11. (Currently amended) ~~A-~~ The gearbox adaptor ~~according as claimed in to claim 1 including further comprising a standard gearbox comprising a plurality of gears; from which the without synchro hubs and cones have been removed and wherein the gearbox adaptor has been~~ is fitted to each gear of the standard gearbox, with part of each hub mounted on the gear shaft and each clutch means engaged engages with the a corresponding gear.

12. (Currently amended) ~~An-~~ The gearbox adaptor ~~according to as claimed in claim 7 including further comprising a standard gearbox from which the synchro hubs and cones have~~

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~~been removed comprising a plurality of gears, and wherein the gearbox adaptor has been~~ fitted between ~~each a pair of adjacent gears of the standard gearbox, with each hub mounted on the gear shaft between said two adjacent gears and part of one clutch means engaged with one of said gears and part of the other clutch means engaged with the other of said gears.~~

13. (Currently amended) A sequential gearbox ~~including comprising~~ a standard gearbox comprising a plurality of gears from which the without synchro hubs and cones have been removed and wherein and two or more gearbox adaptors as claimed in claim 1, each of the gearbox adaptor being fitted to the ~~has been fitted to each~~ plurality of gears of the standard gearbox, with part of each hub of each gearbox adaptor mounted on the gear shaft and each clutch means of each gearbox adaptor engaged with ~~the a~~ corresponding gear of said standard gearbox, said sequential gearbox further including electronic control means which comprises two micro-switches ~~which are connected via a sequencing arrangement to a set of solenoid valves, one each solenoid valve being connected to the means for supplying fluid to each piston of the two or more gearbox adaptors such that fluid is supplied to said piston when said solenoid valve is opened and fluid is withdrawn from said piston when said solenoid valve is closed;~~

the electronic control means being such that each time the first micro-switch is closed, the sequencing arrangement closes any solenoid valve ~~which that is opened~~ and opens the next solenoid valve in a predetermined first sequence; and

~~and each time the second micro-switch is closed, the sequencing arrangement closes any solenoid valve which that is opened and opens the next solenoid valve in a predetermined second sequence.~~

14. (Original) The sequential gearbox as claimed in claim 13, wherein said predetermined second sequence is the reverse of said predetermined first sequence.

15. (Currently amended) A sequential gearbox ~~including comprising~~ a standard gearbox comprising a plurality of gears from which the having at least one pair of adjacent gears

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~~without synchro hubs and cones have been removed and wherein~~with a gearbox adaptor as claimed in claim 7 ~~has been fitted~~ between each pair of adjacent gears, with part of each hub of each gearbox adaptor mounted on the gear shaft between said two pair of adjacent gears and part of one the at least one clutch means engaged with one of said gears of said pair of adjacent gears and part of the other second clutch means engaged with the other of said gears of said pair of adjacent gears, further including electronic control means, which comprises two micro-switches ~~which are connected~~ via a sequencing arrangement to a set of solenoid valves, ~~one each~~ solenoid valve being connected to the means for supplying fluid to each piston of the gearbox adaptor such that fluid is supplied to said piston by said solenoid valve when said solenoid valve is opened and fluid is withdrawn from said piston when said solenoid valve is closed; the electronic control means being such that each time the first micro-switch is closed, the sequencing arrangement closes any solenoid valve ~~which that~~ is opened and opens the next solenoid valve in a predetermined first sequence; and each time the second micro-switch is closed, the sequencing arrangement closes any solenoid valve ~~which that~~ is opened and opens the next solenoid valve in a predetermined second sequence.

16. (Previously presented) The sequential gearbox as claimed in claim 15 wherein said predetermined second sequence is the reverse of said predetermined first sequence.

17. (Currently amended) The gearbox adaptor as claimed in claim 4 wherein said first series of spaced plates are engaged with an inner surface of said hub and said second series of spaced plates are engaged with ~~the an~~ outer surface of a boss ~~which that~~ surrounds the shaft and protrudes from ~~the a~~ central region of the side wall of said at least one gear.

18. (Currently amended) The gearbox adaptor as claimed in claim 17 wherein said first and second series of spaced plates and said at least one piston(s) are all disc shaped, each having a central opening into which said boss protrudes.

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19. (New) A gearbox comprising:

a casing defining a longitudinal axis comprising a wall and at least one passage through the wall having a section extending substantially perpendicularly to the longitudinal axis of the casing;

a hub defining a longitudinal axis comprising a central portion, at least one annular recess, and at least one passage, the hub being coaxially disposed with the casing;

at least one piston positioned at least partially within the at least one annular recess of the hub;

an interior passage located between the at least one piston and the central portion of the hub in fluid communication with the at least one passage of the hub;

a fluid supply source for supplying fluid through the at least one passage of the casing and the at least one passage of the hub to the interior passage in an inwardly flow direction to pressurize a first face of said at least one piston so as to move said at least one piston in a first direction;

at least one gear locatable on a shaft adjacent said hub;

at least one clutch pack positioned between said at least one piston and said at least one gear, part of said at least one clutch pack being engaged with said hub and a different part of said clutch pack being engageable with said at least one gear;

wherein said at least one gear is freely rotatable relative to said shaft, and said at least one clutch pack being located and arranged such that movement of said at least one piston in said first direction inter-engages said parts of said at least one clutch pack to drivingly engage said at least one gear with said shaft.

20. (New) The gearbox as claimed in claim 19, further comprising a second annular recess and a second piston positioned at least partially within the second annular recess.

21. (New) The gearbox as claimed in claim 19, further comprising a second passage through the wall of the casing.

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22. (New) The gearbox as claimed in claim 19, further comprising a control system for controlling fluid flow from the fluid supply source.

23. (New) The gearbox as claimed in claim 22, further comprising at least one solenoid valve.

24. (New) The gearbox as claimed in claim 19, further comprising a second piston, a second interior passage, a second gear, and a second clutch pack.

25. (New) The gearbox as claimed in claim 19, wherein the part of the clutch pack comprises a plurality of splines or dogs adapted to mesh with corresponding grooves or splines located in the hub.

26. (New) The gearbox as claimed in claim 19, wherein the inwardly flow direction comprises a radial flow direction.

27. (New) A gearbox for sequentially rotating a plurality of gears mounted on a gear shaft comprising a hub, two pistons each comprising an outside diameter and an inside diameter, and two clutch packs mounted inside a casing between two gears;

a fluid supply source for selectively supplying fluid to one of the two pistons to pressurize one side of said piston;

wherein each clutch pack comprises a first pack part in rotational relationship with the hub and a second pack part in rotational relationship with one of the gears;

wherein when fluid pressurizes one side of one of the pistons, the piston moves in a first direction to push the first pack part to matingly engage the second pack part to then cause the gear, to which the second pack part is in rotational relationship, to be in rotational relationship with the hub; and

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wherein pressurized fluid passes through a passage in a wall of the casing and a passage in the hub and flows towards the piston from the outside diameter portion of the piston towards the inside diameter portion of the piston.

28. (New) The gearbox as claimed in claim 27, further comprising two interior passages located between the two pistons and the hub.

29. (New) The gearbox as claimed in claim 27, wherein one of the gears has a greater outside diameter than the other gear.

30. (New) The gearbox as claimed in claim 27, further comprising a second passage in the wall of the casing and a second passage in the hub.

31. (New) The gearbox as claimed in claim 27, further comprising a control system for controlling fluid flow from the fluid supply source.

32. (New) The gearbox as claimed in claim 31, further comprising at least one solenoid valve.